Climate Risk Insurance
Suggestions for Compensation-Based Climate Risk Insurance

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Global Framework of Climate Insurance Solutions: "Climate Justice"

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- Climate change impacts are already visible in the patterns of weather related disasters. The most vulnerable to these changes are the people in poor and developing countries.
- Principle of Climate Change Insurance: Climate Justice
- Development of a risk transfer mechanism based on the principle of compensation
- In essence: principle of causation is also considering the principle of capacity as per capita CO_2 emission correlate with per capita GDP
- Risk transfer payouts should be linked to extraordinary loss events, which with a certain probability are caused (or intensified) by global warming

IPCC 4AR 2007:
Extreme Events and Global Warming

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Phenomenon[a] and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend[b]	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	*Very likely*[c]	*Likely*[d]	*Virtually certain*[d]
Warmer and more frequent hot days and nights over most land areas	*Very likely*[e]	*Likely (nights)*[d]	*Virtually certain*[d]
Warm spells/heat waves. Frequency increases over most land areas	*Likely*	*More likely than not*[f]	*Very likely*
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	*Likely*	*More likely than not*[f]	*Very likely*
Area affected by droughts increases	*Likely* in many regions since 1970s	*More likely than not*	*Likely*
Intense tropical cyclone activity increases	*Likely* in some regions since 1970	*More likely than not*[f]	*Likely*
Increased incidence of extreme high sea level (excludes tsunamis)[g]	*Likely*	*More likely than not*[f,h]	*Likely*[i]

very likely > 90% **likely >66%** **more likely than not > 50%**

Conditions for Climate Insurance Concepts

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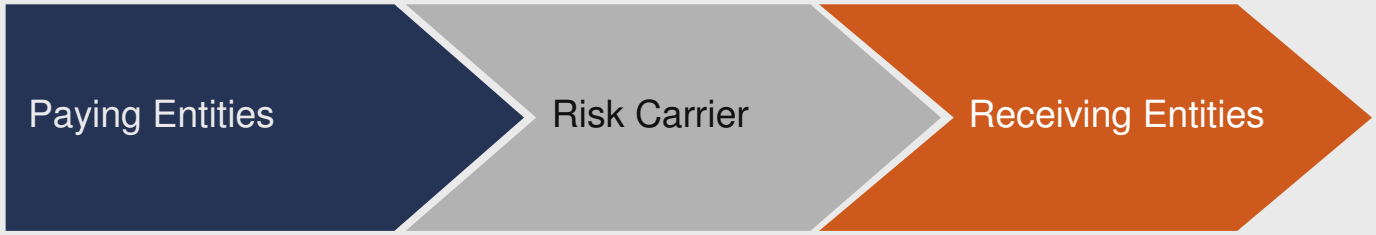
Global Climate Insurance Concepts should contain a **transfer mechanism**, that shifts funds (premiums) from countries who cause climatic changes to such entities who suffer from climatic changes (indemnity payment) via an insurance scheme (risk carrier):

- **Paying Entities**: Countries, who cause emissions of carbon dioxide of more than a fixed threshold (e.g. 5 t / capita). Payment could be proportional to difference of current emissions to the threshold times population.
- **Receiving Entities**: Countries who are adversely affected by climatic change (in principle can also be "paying countries")
- **Risk Carrier:** Administration of premium / indemnity payments and loss evaluation. Responsible for transfer mechanism on a sound technical insurance basis



Potential structure for a Climate Change Protection Scheme

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Source of Funds

1.) CO_2 emissions per capita

2.) Profit from emission trading

3.) Carbon emission fee

Fee "Insurance premium"

Insurance policies on parametric basis

Insurance Payout

Facility

- Insurance License
- Appoints receiving countries
- Nominates/calculates paying countries
- Evaluating country risk (exposure based on climate change)
- Collects premium
- Negotiates reinsurance arrangements
- Evaluating country payout
- Effects indemnity payment
- In charge of additional preventive measures

Reinsurance premium

Reinsurance

Reinsurance payout

Risk Carrier

- Reinsurance Market
- Cat Bond Market
- Global Insurance Pool
- or various combinations of above

Conditions for Climate Insurance Concepts

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All Climate Insurance Concepts should be/have:

- Easy to understand and to evaluate
- Applicable on a sound worldwide available data basis
- Standardized rules and regulations
- Cost efficient administration
- Prompt indemnity payment to affected countries
- Indemnity payments for losses which are caused by atmospheric phenomena (e.g. extremes of wind speed, precipitation)
- For insurance purposes, concepts have to be developed on a sound technical basis
- Payments can either be to governments or private persons (e.g. via Microinsurance) and shall consider prevention measures

Conditions for Climate Insurance Concepts

Triggers in the insurance industry

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Definition
A trigger is an event that initiates others, or incites a response.

Traditional triggers	Non-traditional Triggers
Usually, the payout is triggered, if the insured has suffered a loss of a certain level, that is covered under the policy.	Sometimes it is not feasible to base the payout on the loss itself (e. g. due to moral hazard, actual loss amount can not be assessed). In such occasions an insurance solution can be developed by using a value, that is highly correlated to the loss, however can be measured objectively or is outside of the control of the insured. (e. g. wind speed instead of loss due to windstorm, market loss instead of own loss)
“Indemnity based trigger”	**“Non-indemnity based, parametric trigger”**

Conditions for Climate Insurance Concepts

A non-indemnity based trigger has to comply with certain criteria and requirements

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General criteria
▪ Trigger has to be undisputable, determined reliably and accepted from both parties in advance
▪ Trigger cannot be influenced by any party
▪ Trigger has to correlate with the losses intended to be covered
• Enough data is available to assess the risk
• Administration is simple (no individual assessment for each client)
• Same product can be sold several times to similar clients/with similar structure
• Good publicity can be achieved

Conditions for Climate Insurance Concepts

External triggers can not be influenced by the insured party

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Internal trigger	External trigger
▪ Indemnity based trigger (Traditional (re)insurance)	▪ Event based trigger (CDS, event cancellation, …) ▪ Parametric trigger (temperature, EQ magnitude, wind speed, …) ▪ Index based trigger (Wind index, GDP, …) ▪ Industry trigger (ILW, …) ▪ Modelled industry loss trigger ▪ Linked trigger (Portfolio replication) ▪ Modelled loss trigger
trigger based on variable specific to the cedant	**trigger outside the immediate control of both the cedant and the insurer**

Conditions for Climate Insurance Concepts

Trigger Concepts

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Single Trigger concept:

Definition: Indemnity payments in case of incidence of **one** trigger

Double Trigger concept:

Definition: Indemnity payments in case of incidence of **two** triggers:

1. **index based trigger:** economic loss (caused by a natural hazard), expressed in monetary values or in the GDP of a country

and (as a condition)

2. **parametric trigger:** natural hazard exceeding pre-defined values (precipitation, wind velocity, etc.)

A) Parametric based trigger concept: Price Tag (1/2)

Single Trigger concept

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Definition:	**Fixed monetary payments for different natural hazards exceeding a pre-defined value.**
Trigger:	Unusual deviation of frequency and/or magnitude of natural hazards (at least with some attribution to climate change), as to be defined for each country and region
Payout:	Pre-defined values for wind velocity, precipitation (flood, draught), e.g. a flood event results in a fixed indemnity payment of e.g. US$ 150 m Payments are independent of economic strength of the affected country
Advantage:	- Fair and true view (focus on increasing Nat Cat events rather than economic losses). - Independent of economic loss, affected persons, GDP or similar. - Relative benefit higher for poorer countries.
Disadvantage:	- Fixed amount does not reflect the real economic loss (over-evaluated or under-evaluated) - Difficult to gather solid worldwide data base for wind speed and precipitaion
Other features:	- Divisible for two countries, if affected by the same event - Part of indemnity payments have to be invested in preventative techniques (housing in less flood affected regions, construction of floodwalls, use of solid constructions, carbon capture measurements etc.)

A) Parametric based trigger concept: Price Tag (2/2)

Single Trigger concept

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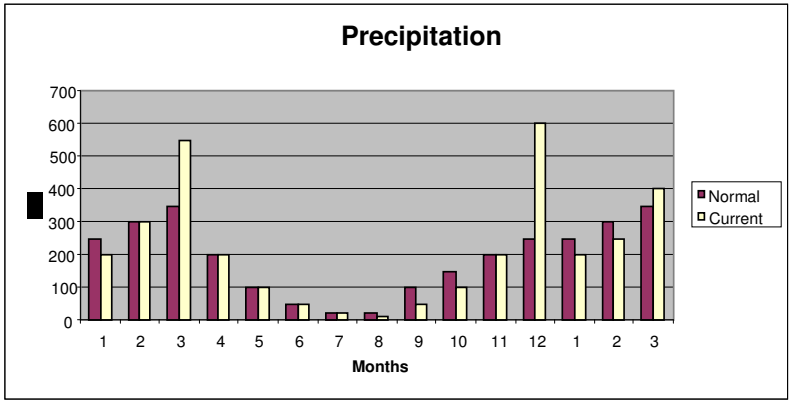
Example Flood

Trigger definition:

- Moving 12-months of monthly observation
- Events with a positive deviation above 50% are fully considered, but in the 12-months observation a total deviation of at least 100% have to be fulfilled
- Definition of suitable regional demarcation
- Frequency and magnitude are considered



- Two months with a deviation of precipitation above 50% between 12 months
- Sum of the two events represents a deviation of the yearly normal value of 197% (therefore above 100%)
- Fixed payment of e.g. US$ 5.0 Mio.

B) Indexed based trigger concept: GNP per capita

Double Trigger Concept

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Definition:	**Monetary payments for losses caused by natural hazards (associated with global warming) considering the GDP of the country**
Trigger:	1. Index based trigger: Ratio of Loss to GDP/capita x affected persons exceeds a pre-defined value (Loss/National GDP would be unfair for larger countries) 2. Parametric trigger: natural hazard exceeding pre-defined values (precipitation, wind velocity, etc.)
Payout:	Pre-defined value per affected person
Advantage:	- Considers the wealth (capability to cope with the disaster) of each country - Pay out could be defined close to real economic loss
Disadvantage:	Difficult to determine the number of affected persons
Other features:	Part of the payments have to be invested in preventative techniques (housing in less flood affected regions, construction of floodwalls, use of solid constructions etc.)

C) Index based trigger concept: Economic Loss (1/2)

Double Trigger Concept

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Definition:	**Monetary payments of real economic losses caused by natural hazards (associated with global warming)**
Trigger:	1. Index based trigger: economic loss exceeding a pre-defined value per country 2. Parametric trigger: natural hazard exceeding pre-defined values (precipitation, wind velocity, etc.)
Payout:	Part of economic losses caused by natural hazards probably attributable to global warming
Advantage:	- Considers the wealth of each country - Pay out linked to real economic loss and countries' financial strength
Disadvantage:	Difficult to determine the economic loss (which should be evaluated by an independent entity, e.g. PCS for USA or PERILS for Europe)
Other features:	Part of the payments have to be invested in preventative techniques (housing in less flood affected regions, construction of floodwalls, use of solid constructions etc.)

B) Index based trigger concept: Economic Loss (2/2)

Double Trigger Concept

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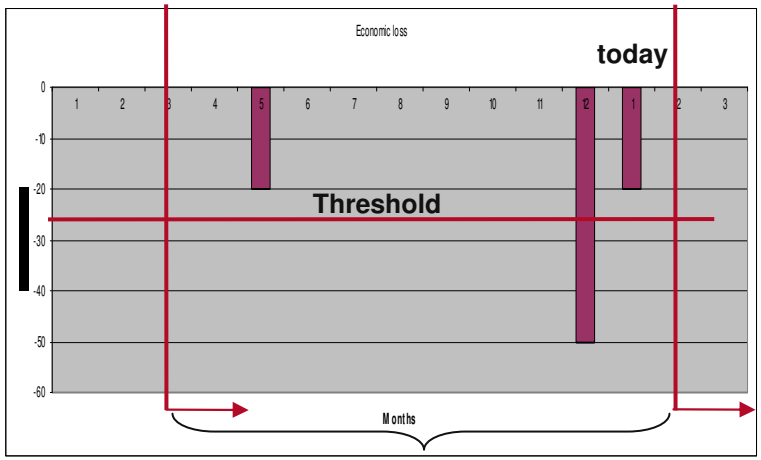
Economic Loss

Trigger definition

- Moving 12-months of losses
- Losses above a certain threshold are counted
- Losses have to be caused by weather related hazards linked with global warming
- Frequency and magnitude are considered

Example: Economic Loss caused by a natural hazard exceeding the threshold



Scope of observation

- Within 12 months three months with economic nat cat losses
- Only the second loss exceeds the pre-defined threshold
- The second loss has to be caused by a proven weather related disaster
- Pay-out of economic loss (e.g. fixed payment of US$ 100m)

D) Parametric based trigger concept: Fatalities/Injured/Homeless

Multi Trigger Concept:

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Definition:	Fixed monetary payments for injured, homeless and/or fatalities caused by weather related natural hazards (associated with global warming)
Trigger:	Fatalities, injured persons, homeless people after a natural hazard event
Payout:	e.g. USD 5,000 per fatality; USD 1,000 per injured person; USD 500 per homeless
Advantage:	- Considers the humanitarian aspect - Richer countries tend to have less fatalities, injured and homeless than poor countries
Disadvantage:	Calculation of a value per person; affected persons do not represent the economic losses caused by natural hazards Early warning systems and evacuation may not be of high priority in affected poorer countries
Other features:	Part of the payments have to be invested in preventative techniques (housing in less flood affected regions, construction of floodwalls, use of solid constructions, early warning systems and evacuation measurements etc.)

Definition of Trigger:
Trigger Drought

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Definition	Extreme negative deviation from the average precipitation value in a suitable regional demarcation
Reference	30 year average precipitation value, measured at all available WMO-stations (or similar institutions) in the area concerned;
Basis for calculation	Difference between current average (over 3 to 6 month) and reference average value;
Trigger Point	Difference must exceed a certain pre-defined value
To consider:	Insufficient data basis

Definition of Trigger:
Trigger Flood

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Definition	Extreme positive deviation from the average precipitation value.
Reference	30 year average precipitation value, measured at all available WMO-stations (or similar institutions) in the area concerned;
Basis for calculation	Difference between current average (one month) and reference average value;
Trigger Point	Difference must exceed a certain pre-defined value
To consider:	Insufficient data basis


Vietnam


China Guilin

Definition of Trigger:
Trigger Wind

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Definition	Extreme wind speed (peak speed) and/or Extreme wind speed for a longer period
Reference	30 year average precipitation value, measured at all available WMO-stations (or similar institutions) in the area concerned;
Basis for calculation	Difference between current average (maximum wind speeds) and reference value;
Trigger Point	Wind speed must exceed a certain pre-defined value
To consider:	Insufficient data basis

2004 Hurricane ivan, Cayman

Definition of Trigger:
Loss/ ((GDP per capita) x people affected)

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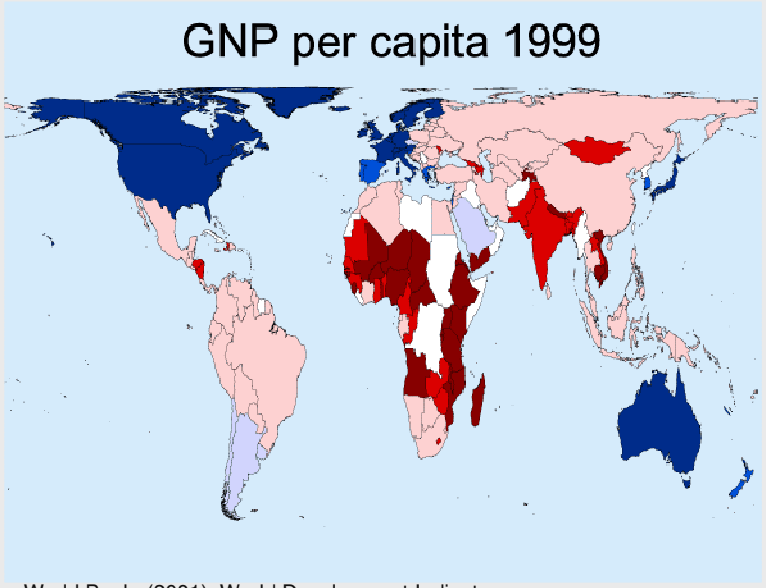
Definition	Gross Domestic Product (GDP): Total monetary value of goods and services produced in a year by the residents of a country. GDP per capita is the total GDP divided by the total population
Reference	Annual values over the last 5 years, measured by legal (inter-)national organizations
Basis for calculation	Negative deviation of x% of expected / actual GNP per capita
Trigger Point	To be defined for each country
To consider:	Inflation Population growth



World Bank. (2001). World Development Indicators. Washington DC: The World Bank.

Climate Insurance: How much money needed?

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Level of current annual total economic losses caused by weather related natural catastrophes:
100 US$ bn (0,2% of global GDP of 48 US$ trn)

Ratio of losses in developing countries: 7% of global losses

Ratio of global warming attribution: rough estimate 20%

Funds needed per year: 100 US$ bn x 7% x 20% = 1.4 US$ bn

2006 total global CO_2 emissions: 30 bn tons

Costs of climate change insurance currently approx.
5 US ct per ton CO_2

A very rough estimate!!!

Outlook to the next steps

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- Calibration of trigger concepts on hand of data from Bangladesh and Malawi (or other country)
- Due to Cyclone in Burma WMO experts have been too busy to provide the data
- In the next months MCII will provide concrete options for climate insurance and offers advice for party submissions
- We would like to invite everybody, who has ideas on how to organize climate insurance to work together with us (e.g. Swiss delegation)